

**TARDIGRADA FROM PATAGONIA  
(SOUTHERN SOUTH AMERICA)  
WITH DESCRIPTION OF THREE NEW SPECIES**

WALTER MAUCCI<sup>1</sup>

ABSTRACT

Twentyeight species of Tardigrada from Chilean and Argentina Patagonia are quoted. Three species described are new for science. These are *Macrobiotus andinus*, *M. patagonicus* (both with two macroplacoids) and *Hexapodibius beasleyi*, whose claws have only the main branch, and no secondary one.

RESUMEN

Se citan 28 especies de Tardigrada colectadas en el área Patagónica de Chile y Argentina. Se describen tres nuevas especies: *Macrobiotus andinus*, *M. patagonicus* (ambas con 2 macroplacoides) y *Hexapodibius beasleyi*, cuyas garras tienen solamente la rama principal.

Patagonia is a vast region of South America covering areas of Argentina and Chile. Its borders are the Straits of Magellan in the south, Rio Colorado (Argentina) and the Gulf of Corcovado (Chile) in the north. Argentine Patagonia includes the provinces of Rio Negro, Chubut and S. Cruz, the Chilean side covers the provinces of Chiloé, Aysén and Magallanes. The territory can be roughly divided between the vast extension of the pampa in the east and the andean region in the west.

Nothing is yet known about the Tardigrada from the pampa, but from the andean region there is some information from the Chiloé province and from very few localities in the provinces of Rio Negro (El Bolsón, Mt. Tronador) and of Chubut (El Turbio). The present paper deals with Tardigrada collected in the andean region of Argentina (S. Cruz) and Chile (Magallanes).

MATERIAL AND METHODS

The material that has been examined consists of several samples of mosses and lichens collected in February 1987. The samples have been collected in the following localities.

Argentina (shores of Lake Argentino, prov. S. Cruz):

La Bandera, near Calafate: lichens from rocks in full sunlight;

Near the Onelli glacier: mosses and lichens from treetrunks and rocks, in the shade, in the *Nothofagus* forest;

Near the Perito Moreno glacier: mosses in the shade, in the *Nothofagus* forest.

Chile (reg. XII, Magallanes):

Parque Nacional Torres del Paine: mosses from treetrunks and rocks, nearly all in half sunlight;

Near Lake Sarmiento: mosses from soil, in full sunlight;

Ultima Esperanza, near the Cueva del Milodón: mosses from rocks in sunlight;

Puerto Natales: mosses from treetrunks and rocks;

Punta Arenas: mosses from branches in the shade.

The animals and their eggs have been extracted with the usual methods. The specimens, after a first examination while still fresh, have been preserved in permanent preparation and mounted in Polyvinyl-lactophenol. In all 425 animals and eggs have been prepared, and about 150 other specimens have been preserved in alcohol. All the material is deposited in the Maucci Collection,

<sup>1</sup>Via Mameli 9, 37126 Verona (Italy).

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Table 1  
DISTRIBUTION OF TARDIGRADA SPECIES IN SAMPLED LOCALITIES

	1	2	3	4	5	6	7	8
<i>Ech. bigranulatus</i>	+	+		+		+		
<i>Ech. blumi</i>	+	+		+	+	+		+
<i>Ech. marginoporus</i>		+						
<i>Ech. merokensis</i>		+	+	+		+	+	
<i>Ech. wendti</i>	+			+				
<i>Pseud. suillus</i>		+						
<i>Macr. andinus</i> sp. nov.		+				+	+	
<i>Macr. aerolatus</i>		+					+	
<i>Macr. harmsworthi</i>		+	+					
<i>Macr. hufelandi</i>			+					
<i>Macr. patagonicus</i> sp. nov.	+	+		+		+	+	
<i>Macr. richtersi</i>				+		+		
<i>Minib. intermedius</i>						+		
<i>Hyps. allisoni</i>		+				+	+	
<i>Hyps. baumanni</i>	+	+						
<i>Hyps. convergens</i>		+						
<i>Hyps. microps</i>		+						
<i>Hyps. oberhaeuseri</i>								+
<i>Diph. bullatum</i>				+				
<i>Diph. scoticum</i>		+					+	
<i>Hebes. conjungens</i>	+	+		+		+		
<i>Platicr. angustata</i>		+						
<i>Itaq. umbellinae</i>		+						
<i>Isoh. bakonyiensis</i>						+		
<i>Isoh. lunulatus</i>							+	
<i>Hexap. beasleyi</i> sp. nov.				+				
<i>Parhex. castrii</i>				+		+		
<i>Miln. tardigradum</i>	+	+	+	+		+		+

Localities: 1, La Bandera; 2, Onelli; 3, Perito Moreno; 4, Paine; 5, Lake Sarmiento; 6, Ultima Esperanza; 7, Puerto Natales; 8, Punta Arenas.

of the Civic Museum of Natural History, Verona (Italy).

Altogether 28 species have been found. Of these 16 are already known from Patagonia, while 12 are new for this region, and 3 of them are new for science. Table 1 shows a list of the species and the localities where they have been found.

#### SPECIES ALREADY QUOTED FROM PATAGONIA

In brackets the quotation already existing in literature.

*Echiniscus bigranulatus* Richters, 1907 (Iharos, 1963; Ramazzotti, 1964).

*Echiniscus blumi* Richters, 1903 (Iharos, 1963; Mihelčič, 1967).

*Echiniscus wendti* Richters, 1903 (Marcus, 1936).

*Pseudechiniscus suillus* (Ehrbg, 1853) (Ramazzotti, 1964; Mihelčič, 1967).

*Macrobiotus harmsworthi* Murray, 1907 (Iharos, 1963; Mihelčič, 1967).

*Macrobiotus hufelandi* Schultze, 1833 (Iharos, 1963; Mihelčič, 1967).

*Macrobiotus richtersi* Murray, 1911 (Iharos, 1963).

*Minibiotus intermedius* (Plate, 1888) (Iharos, 1963; Mihelčič, 1967).

*Hypsibius baumanni* Ramazzotti, 1962 (Iharos, 1963).

*Hypsibius convergens* (Urbanovicz, 1925) (Iharos, 1963).

*Hypsibius microps* Thulin, 1928 (Iharos, 1963).

*Hypsibius oberhaeuseri* (Doyéré, 1840) (Mihelčič, 1967).

*Diphascion bullatum* Murray, 1905 (Iharos, 1963).

*Diphascion scoticum* Murray, 1905 (Iharos, 1963; Mihelčič, 1967).

*Hebesuncus conjungens* (Thulin, 1911) (Mihelčič, 1967).

*Milnesium tardigradum* Doyéré, 1840 (Iharos, 1963; Mihelčič, 1967).

#### SPECIES NEW FOR PATAGONIA

*Echiniscus marginoporus* Shuster *et al.*, 1983

This is the second find of this species, known until now only from the typical locality of Venezuela.

*Echiniscus merokensis* Richters, 1904

Species with a very large diffusion and very common in the northern hemisphere. Until now it has been quoted from south of the Ecuador only once, from Angola.

*Macrobotus areolatus* Murray, 1907

Species with a large but discontinuous diffusion. Although already quoted from Argentina and Chile, it had not yet been quoted from Patagonia.

*Macrobotus andinus* sp. nov.  
(Figs. 1 & 4)

**Description of the holotype.** Length 422  $\mu\text{m}$ ; colour gray; ocular spots are absent. The cuticle is smooth, without pores. Peribuccal lamellae are present. The buccal armature is composed of the anterior band of minute teeth; a posterior crown, very marked, of elongated triangular teeth a bit larger on the ventral side, followed by a crown of tiny rounded teeth disposed in several irregular rows, and then by the transversal ridges; ventrally, behind the medio-ventral ridge there are three more round teeth, irregularly distributed. The buccal tube is large (10  $\mu\text{m}$ , viz 16.67  $\mu\text{m}$ ). The pharynx is short-oval (39.6  $\times$  34.6  $\mu\text{m}$ ) and contains strong apophyses, two rod shaped macroplacoids and thin, elongated microplacoid (6  $\mu\text{m}$ ). The first macroplacoid has a pointed anterior apex and is 17  $\mu\text{m}$  long; the second one, with a clublike swelling in its rear part, is 9  $\mu\text{m}$ .

The claws are relatively small, very thick, with strong accessory spines. The lunules are small and smooth.

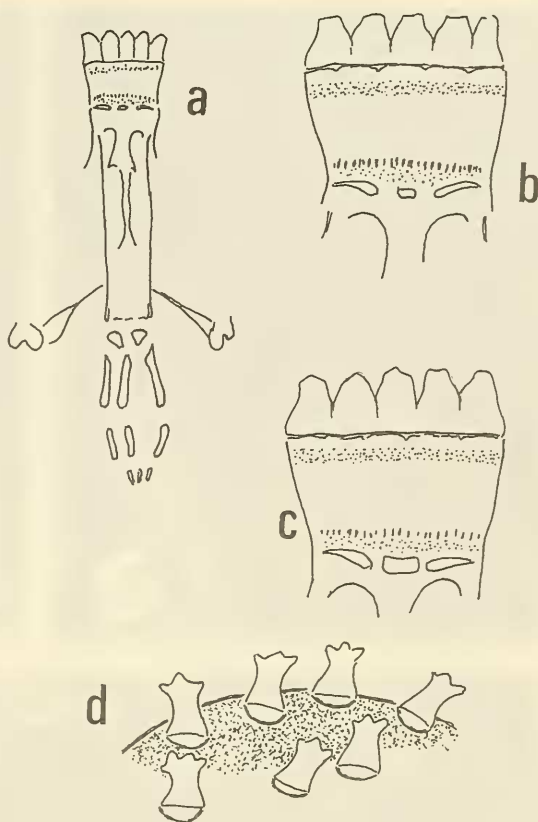


Figure 1. *Macrobotus andinus* sp. nov. a) buccal apparatus; b) buccal armature, ventral view; c) buccal armature, dorsal view; d) fragment of egg.

**Paratypes.** Ten paratypes have been examined, two of which are new-born about to hatch. The dimensions of the paratypes, excluding the new-born, which cannot be measured, range between a minimum of 382  $\mu\text{m}$  and a maximum of 703.5  $\mu\text{m}$ . The color is always gray and the eye-spots are consistently absent. The characteristics of the placoids are constant. The first one is always pointed anteriorly and generally does not present even the slightest constriction.

Table 2 shows the biometrical data (n=9, that is excluding the two new-born but including the holotype).

**Eggs.** Altogether 16 eggs have been found, 3 of which with embryo. The dimensions range between a minimum of 97 and a maximum of 130  $\mu\text{m}$  (excluding the chorion processes) with an average of  $119.55 \pm 10.74$  (n=9, that is all those that can be measured exactly). The processes are between 5.5 to 9  $\mu\text{m}$  high. Their

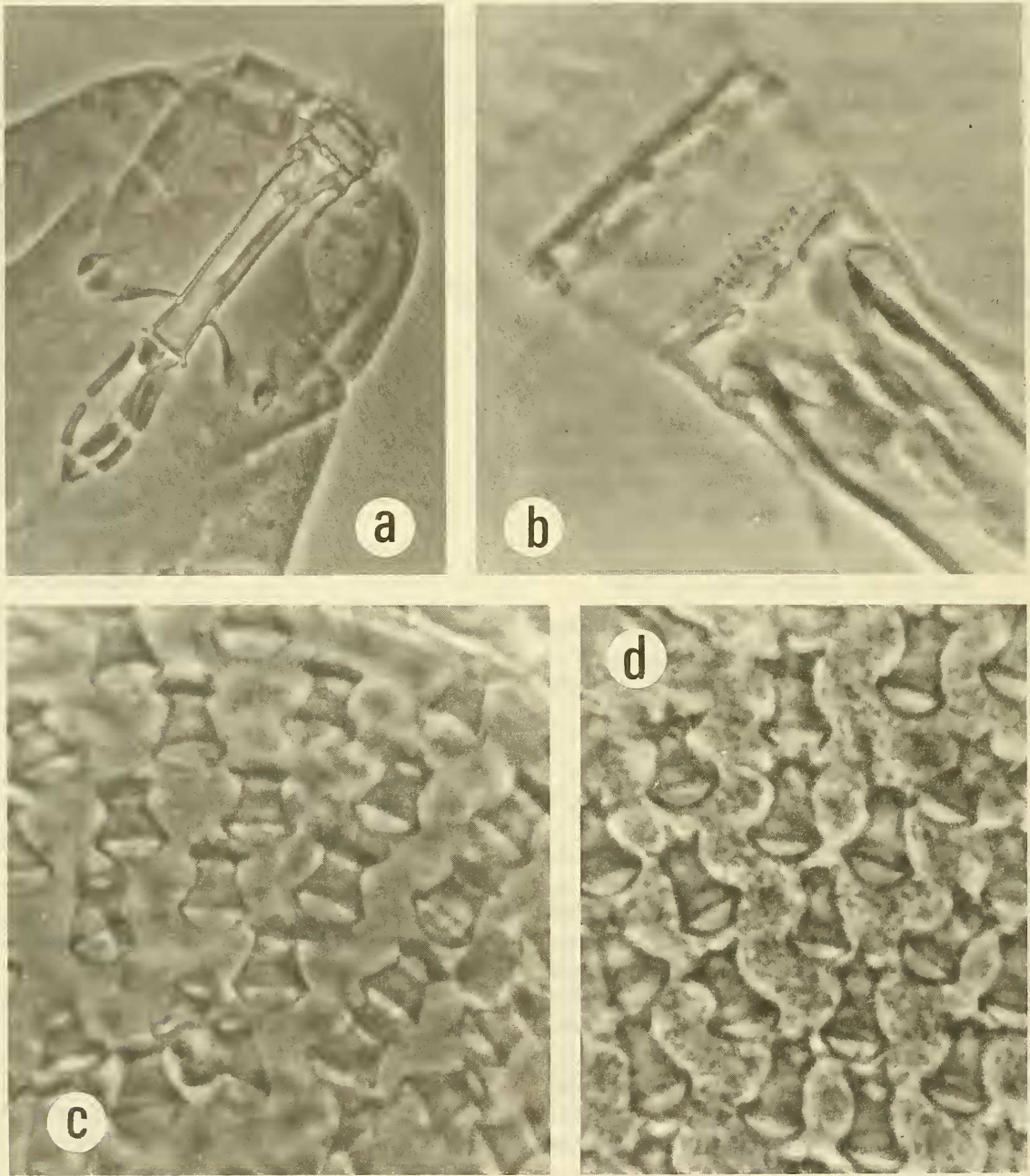


Figure 4. Details at optical microscope, of *Macrobiotus andinus* sp. nov. a) buccal apparatus; b) buccal armature, dorsal view; c & d) fragments of eggs.

Tabla 2  
MEASUREMENTS IN  
*MACROBIOTUS ANDINUS* SP. NOV.

	mean	stand. dev.
Body length	548.29	108.77
Buccal tube length	108.38	16.54
Buccal tube width	16.26	2.72
Stylet supp. insert <sup>1</sup> .	82.62	1.30
Macroplacoid row	48.80	2.70

<sup>1</sup>Distance between the anterior edge of buccal tube and the insertion of the stylet supports on the tube. Body length is expressed in  $\mu\text{m}$ ; buccal tube length is expressed in  $ms$  (Thulin, 1928); all others are expressed in  $pt$  (Pilato, 1981). N = 9.

shape is cylindrical or slightly like a truncated cone; there are 4-6 (generally 4) short and stumpy appendices on the tip; the base of the processes is heavily marked. Between 25 and 28 processes are visible on the optical section. The shell presents small pores which appear as a fine granulation.

**Observations.** The general aspect of the bucco-pharyngeal apparatus, the type of buccal-armature in particular, and the absence of cutaneous pores, may suggest a closeness to the "*grandis-spectabilis* group". Nevertheless *M. andinus* is substantially different from the latter species both in its dimensions and in the absence of eye-spots. The eggs are also completely different. They could, perhaps, be compared to those of *M. fuciger*. It is, anyhow, only a superficial similarity, all the more that *fuciger* is a species with 3 macroplacoids.

*M. andinus* is present in various samples coming from three localities: Onelli glacier (8 specimens and 14 eggs); Puerto Natales (1 specimen); Ultima Esperanza (2 specimens and 2 eggs). The holotype comes from Onelli and is deposited in the Maucci Collection of the Civic Museum of Natural History, Verona, catalogued under n° C.T. 13352.

*Macrobiotus patagonicus* sp. nov.  
(Figs. 2 & 5e, f)

**Description of the holotype.** Length 528  $\mu\text{m}$ ; colour white with irregularly distributed spots of brown pigment on the caudal area; ocular spots are present. The cuticle is smooth and presents several small elliptical pores, not

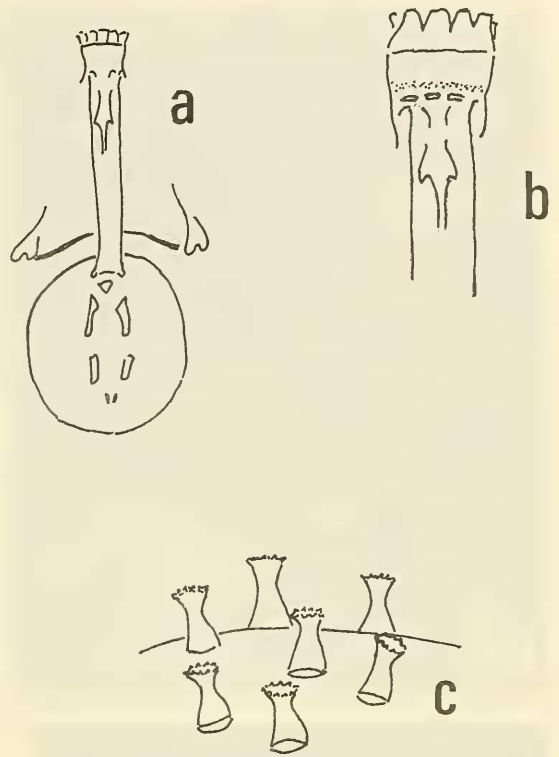


Figure 2. *Macrobiotus patagonicus* sp. nov. a) buccal apparatus; b) buccal armature; c) fragment of egg.

arranged in rows. Peribuccal lamellae are present. In the buccal armature the first band of minute teeth is absent. Posteriorly, though, there is a crown formed by several irregularly arranged rows of tiny dotlike teeth. This is followed by three dorsal transversal ridges, and three fairly thin ventral ones; of these the medio-ventral ridge is the shortest and is shaped like a large oval tooth.

The buccal tube is moderately large (7.25  $\mu\text{m}$ , viz 14.07  $pt$ ). The pharynx is oval (59.4  $\times$  52.8  $\mu\text{m}$ ) with strong apophyses and two rod shaped macroplacoids (13.2 and 7.92  $\mu\text{m}$  long, respectively). The first macroplacoid is pointed anteriorly and presents no constrictions; microplacoids are present, 3.7  $\mu\text{m}$  long, and very thin.

The claws are very thick, with strong accessory spines; the lunules are small and smooth.

**Paratypes.** 77 paratypes have been collected, including 4 new-born, just hatched. Two of the new-born are 148.5 and 190  $\mu\text{m}$  long, respectively. The maximum length is



Figure 5. Details at optical microscope. *Macrobiotus patagonicus* sp. nov.: e) buccal apparatus; f) fragment of egg. *Hexapodius beasleyi* sp. nov.: g) habitus; h & i) claws, 1st and 2nd pair of legs.

580  $\mu\text{m}$ . Ocular spots are present in about half the specimens. The color is white, gray or brownish, deeper in the caudal area. Often there are irregularly distributed dark brown or blackish spots.

Table 3 shows the biometrical data calculated on a random of 25 specimens.

Table 3  
MEASUREMENTS IN  
*MACROBIOTUS PATAGONICUS* SP. NOV.

	mean	stand. dev.
Body length	524.45	37.47
Buccal tube length	93.74	6.89
Buccal tube width	12.27	1.97
Stylet supp. insert <sup>1</sup>	78.77	2.26
Macroplacoid row	46.17	6.98

<sup>1</sup>See Table 2.

Measures expressed like table 2. N = 25.

**Eggs.** 38 eggs have been collected (two of which in exuvia), and 4 of them, broken, show the new-born about to hatch or already hatched. The eggs are spherical, colourless, and their diameter (excluding the processes) ranges from a minimum of 70 to a maximum of 115  $\mu\text{m}$ , with an average of  $98.27 \pm 11.73$  ( $n=20$ ). The processes, more or less high (between 5.75 and 10.50  $\mu\text{m}$ ) are shaped like a truncated cone; their height is about double the width of the base, and the tip ends in a large funnel like flare, indented on the edge. The base of each process is clearly marked by a wreath of very densely distributed dots. On the optical section there are between 20 to 36 processes (generally 24-27). The chorion between the processes is smooth and without pores.

**Observations.** Because of the characteristics of the animal and those of the eggs, *M. patagonicus* can be included, at an infragenus level, in the group of species known as "*hufelandi* complex". The characteristics in common with *M. hufelandi* Schultze, 1833 are those of the buccal armature and in particular the absence of the anterior band of minute teeth. However there is a difference, though not very significant in the first macroplacoid: this presents only in very few specimens a very

slight constriction, while in *M. hufelandi* the first macroplacoid presents nearly always a more or less considerable constriction.

The eggs, although superficially similar to those of *hufelandi* (or at least to some of its varieties), have no pores in the shell, which looks completely smooth.

*M. persimilis* Binda & Pilato, 1972 has a similar characteristic but its egg processes are considerably shorter and stumpy, while the animal has the anterior band of teeth, the first placoid greatly constricted and crenates lunules on the IVth pair of legs.

*M. patagonicus* is present in many samples from La Bandera (6 specimens and one egg), Onelli (3 specimens and 22 eggs), Puerto Natales (7 specimens and 3 eggs), Ultima Esperanza (26 specimens and 9 eggs) and Torres del Paine (6 specimens and 3 eggs). The holotype comes from the Onelli glacier, and is deposited, with the paratypes, in the Maucci Collection, where it is catalogued under n° C.T. 13348.

#### *Hypsibius allisoni* Horning *et al.*, 1978

This species was known so far only from New Zealand. The 12 specimens found in Ultima Esperanza, Puerto Natales and near the Onelli glacier, have been determined through a comparison with specimens from New Zealand. The species is very similar to *H. dujardini* (Doyéré, 1840), especially in the shape and dimensions of the claws and in the presence of a cuticular bar between the claws of the IVth pair of legs; it differs from *H. dujardini* in the absence of septula.

#### *Platicrista angustata* (Murray, 1905) (*Diphascon angustatum* Murray)

Species known so far only from several localities of the palearctic region. The one specimen found near Lake Argentino is the only find from the southern hemisphere.

#### *Itaquascon umbellinae* Barros, 1939

The only specimen found was very close to moulting and its buccal apparatus was poorly distinguishable. On the basis of its redescription by Dastych, 1975, this specimen could possibly be attributed to this species.

*Isohypsibius bakonyiensis* (Iharos, 1964)  
 (*Hypsibius* (*I.*) *sattleri* Auct., partim)  
 and  
*Isohypsibius lunulatus* (Iharos, 1966)

Because of the taxonomic uncertainties relative to nearly all the species of the so called "tuberculatus-group", it is impossible to have a clear picture of the real geographical distribution of these two species, which are fairly common and diffused.

*Parhexapodibius castrii* (Ramazzotti, 1964)  
*Hypsibius* (*Calohypsibius*) *castrii* Ramazzotti,  
 1964

*Haplomacrobotus castrii*: Pilato, 1969  
*Hexapodibius castrii*: Maucci, 1981  
*Parhexapodibius castrii*: Pilato, 1982

It is a species known from Chile, Puerto Rico and California. I found it in the Chilean Patagonia, and also on Easter Island.

*Hexapodibius beasleyi* sp. nov.  
 (Figs. 3 & 5g-i)

About ten years ago Clark W. Beasley of McMurry College of Abilene, Texas, sent me very kindly, together with other material, two specimens of Eutardigrada, which he had defined and labelled as *Haplomacrobotus hermosillensis*. After examining them I reached the conclusion that they should rather be attributed to the genus *Hexapodibius*, and that it was a still unknown species. I informed Beasley of this and urged him to publish his find. But to this day it remains unpublished. In my material from Patagonia I have now found a specimen clearly belonging to the same species. To avoid leaving such interesting find unpublished, I am now obliged to publish here the new species. I think it is only fair to dedicate it to the colleague that found it first.

**Description of the holotype.** Length 435  $\mu\text{m}$ ; colour pale yellow; ocular stain absent; cuticle smooth, no pores. Around the mouth there are 12 little papules, grouped two by two. The buccal cavity appears smooth, without armature. Buccal tube narrow (3.5  $\mu\text{m}$ , viz 8.1  $\mu\text{m}$ ) with strengthening rod fairly long; stylet supports inserted at 74.22  $\mu\text{m}$  from the beginning of the buccal tube. The pharynx is short oval, with elongated apophyses. The

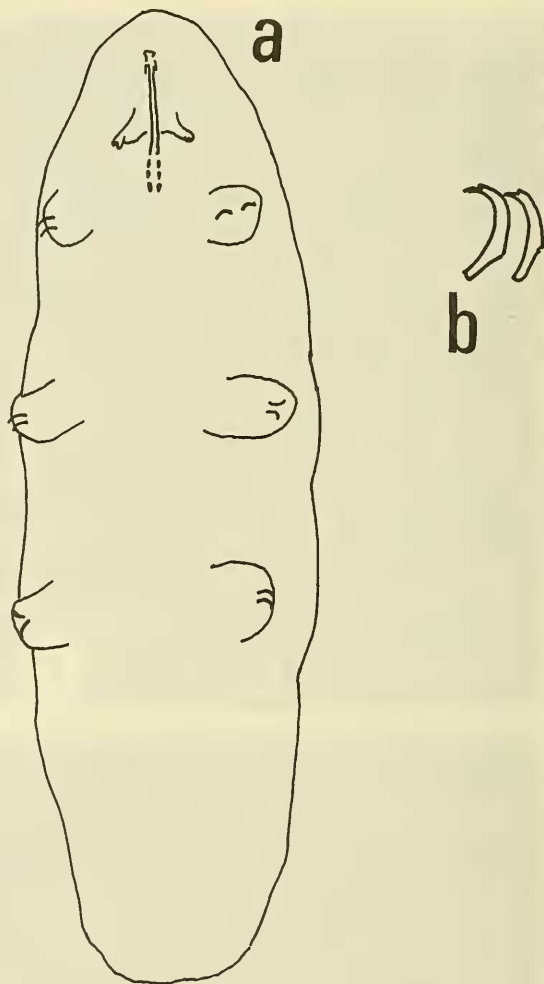


Figure 3. *Hexapodibius beasleyi* sp. nov. a) habitus; b) claws of the 1st pair of legs.

three macroplacoids are shaped like short oval rods. The second one is the shortest (4  $\mu\text{m}$ ), the last and 3rd are of equal length (5.3  $\mu\text{m}$ ). Microplacoid absent.

The claws of the first three pairs of legs are very small (about 5  $\mu\text{m}$ ) and slender at the base; their maximum thickness is at about a quarter of their length. Only the main branch is present: there is no secondary branch. Very small accessory spines, poorly visible. The IVth pair of legs is atrophied, reduced to two modest stumps without claws.

**Paratypes.** The metrical data relative to the two paratypes in my collection are the following:

1) Length 210  $\mu\text{m}$  - buccal tube length 42  $\mu\text{m}$



(200 *ms*) - tube width 2.64  $\mu\text{m}$  (6.28 *pt*) - insertion of stylet supports 27  $\mu\text{m}$  (64.28 *pt*) - placoid row 13.2  $\mu\text{m}$  (31.43 *pt*) - claws lst 3.4  $\mu\text{m}$  (16.19 *ms*).

2) Length 296  $\mu\text{m}$  - buccal tube length 36  $\mu\text{m}$  (121.62 *ms*) - tube width 3  $\mu\text{m}$  (8.33 *pt*) - insertion of stylet supports 26  $\mu\text{m}$  (72.22 *pt*) - placoid row 16.8  $\mu\text{m}$  (46.66 *pt*) - claws lst 4.8  $\mu\text{m}$  (16.21 *ms*).

**Observations.** Since claws I, II and III are without the secondary branch, their derivation from claws of the *Calohypsibius*-type is only an inference. Nevertheless the belonging of this species to family Calohypsibiidae is supported by the very small dimensions of the claws (about 12-16 *ms*), the extreme reduction of the IVth pair of legs, which has no claws (and this leads to the genus *Hexapodibius*) and by the hexamer symmetry of the peribuccal organization. The possibility of such derivation is demonstrated also by *Parhexapodibius castrii*, whose secondary branch of the IVth claws, always extremely reduced, can sometimes be completely missing.

Despite the undeniable similarity in the shape of the claws, genus *Haplomacrobotus* can be excluded. The latter, besides a decamer symmetry of the peribuccal area, has much

bigger claws (about 40-45 *ms*); the legs of the IVth pair are normally developed, with normal claws and the secondary branch present, even if vestigial.

The holotype (catalogued under n° C.T. 7878) and one paratype come from Lake C. Blackwell, Payne Co (Oklahoma, USA), the other paratype comes from Parque Nacional Torres del Paine (Chile).

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